

Abstract

A method for rapidly heating an emission control device in an engine exhaust uses excess air added to the exhaust via an air introduction device. After an engine cold start, the engine is operated to raise exhaust manifold temperature to a first predetermined value by operating the engine with a lean air-fuel ratio and retarded ignition timing. Once the exhaust manifold reaches the predetermined temperature value, the engine is switched to operate rich and air is added via the air introduction device. The added air and rich exhaust gas burn in the exhaust, thereby generating heat and raising catalyst temperature even more rapidly. The rich operation and excess air are continued until either engine airflow increases beyond a pre-selected value, or the emission control device reaches a desired temperature value. After the emission control device reaches the desired temperature, the engine is operated substantially around stoichiometry. Further, a method is described for adaptively learning pump airflow using feedback from an exhaust gas oxygen sensor.